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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
CUNNINGHAM, STEPHEN C	
ART UNIT	**PAPER NUMBER**
3663	

DATE MAILED: 05/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/615,187	EMORI ET AL.	
	Examiner	Art Unit	
	Stephen C. Cunningham	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2-29* is/are rejected.

7)☒ Claim(s) *3* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 09/774,026.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

MARK HELLNER
PRIMARY EXAMINER

Mark Hellner

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 7/9/2003
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claim 3 is objected to because of the following informalities: In line 2, "have" should be –has-. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicant claims that said second pump light have a predetermined amplification bandwidth that does not overlap with a bandwidth of said optical signal. Examiner has included a page from Agrawal depicting the Raman gain spectrum. This figure (2.18 a) depicts a positive gain in the range of 20 through 26 THz. It is unclear whether any gain from the second pump light may be applied to the optical signal. For examining the instant invention, it is assumed that the limitation intends to exclude the primary gain band (about 5 THz to about 18 THz).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 2-7 and 18-29 are rejected under 35 U.S.C. 102(e) as being anticipated by Stentz et al. US 6,163,636 (Hereafter "Stentz").

Regarding claim 2, Stentz teaches a Raman amplification method comprising steps of:

inputting from a signal output end of an optical fiber a first pump light so as to Raman-amplify an optical signal in said optical fiber; and

inputting from a signal input end of the optical fiber a second pump light having a shorter wavelength than the first light so as to Raman-amplify the first pump light, wherein a wavelength difference between the optical signal and said second pump light being in an inclusive range of 20 THz through 26 THz.

See, for example, figure 7 and column 5, lines 11-14. Please notice that the cited text specifically states that the second pump center wavelength overlaps the endpoint of the claimed range at 26 THz. The stated longest second pump wavelength compared to the stated short signal wavelength is approximately 23 THz.

Regarding claim 3, Stentz teaches a Raman amplification method wherein:

a second pump light have a predetermined amplification bandwidth that does not overlap with a bandwidth of said optical signal. It is asserted that the overlap in second

pump light range taught by Stentz and in the instant invention also overlaps the band where the second pump light does not amplify the optical signal.

Regarding claim 4, Stentz teaches a Raman amplification method wherein:

a central wavelength of the second pump light being shorter than a central wavelength of the first pump light by an amount of Raman shift of said optical fiber.

See, for example, column 3, lines 55-58.

Regarding claim 5, Stentz teaches a Raman amplification method wherein: a central wavelength of said second pump light being shorter in wavelength than a wavelength of the first pump light by about an amount of a Raman shift. See, for example, figures 5, 6, and column 3, lines 55-58.

Regarding claim 6, Stentz teaches a Raman amplification method, wherein: said second pump light is a wavelength division multiplex light. See, for example, column 3, lines 40-43.

Regarding claim 7, Stentz teaches a Raman amplification method comprising a step of:

introducing a third pump light so as to Raman-amplify said second pump light. See, for example, column 5, lines 19-55.

Regarding claim 18, Stentz teaches Raman amplification method further comprising a step of:

inputting from a signal output end of an optical fiber a first pump light so as to Raman-amplify an optical signal in said optical fiber;

inputting from a signal input end of the optical fiber a second pump light having a central wavelength that is shorter than that of the first pump light so as to Raman-amplify the first pump light; and

avoiding deterioration of system noise figure by maintaining a level of the optical signal to be substantially the same or greater than input and output levels throughout an entire span of the optical fiber. See, for example, discussion regarding claim 1 and Figures 4(a)-(c) and the descriptions thereof.

Regarding claim 19, Stentz teaches Raman amplification method further comprising a step of: introducing from said signal output end of said optical fiber a third pump light so as to Raman-amplify said first pump light. See, for example, figures 5, 6 and 7. Figures 5 and 6 depict multiple pump wavelengths including a third pump light pumping the first order pump light.

Regarding claim 20, Stentz teaches Raman amplification method wherein: a central wavelength of said second pump light being shorter in wavelength than that of the first pump light by an amount of a Raman shift. See, for example, column 3, lines 55-58.

Regarding claim 21, Stentz teaches Raman amplification method wherein: said amplification bandwidth of said second pump light not overlapping a wavelength of said optical signal bandwidth. It is asserted that the overlap in second pump light range

taught by Stentz and in the instant invention also overlaps the band where the second pump light does not amplify the optical signal.

Regarding claim 22, Stentz teaches Raman amplification method wherein: a central wavelength of said second pump light being shorter in wavelength than that of the first pump light by about an amount of a Raman shift. See, for example, column 3, lines 55-58.

Regarding claim 23, Stentz teaches Raman amplification method wherein: said second pump light is a wavelength division multiplex light. See, for example, column 3, lines 40-43.

Regarding claim 24, Stentz teaches Raman amplification method wherein: a difference between said level of said signal through the entire span of said optical fiber and input/output levels being within 0.5dB. See, for example, figure 8.

Regarding claim 25, Stentz teaches Raman amplification method wherein:

inputting from a signal output end of an optical fiber a first pump light so as to Raman-amplify an optical signal in said optical fiber;

inputting from a signal input end of the optical fiber a second pump light having a shorter wavelength than the first pump light so as to Raman-amplify the first pump light; and

controlling a wavelength dependency of a system noise figure by selecting a central wavelength of said second pump light to be a predetermined wavelength.

See, for example, the discussion of claim 1. Stentz further discloses controlling the wavelength dependency based on the central wavelength in column 4, lines 46-throught 54.

Regarding claim 26, Stentz teaches Raman amplification method wherein: said controlling step includes controlling both noise figure and gain. See, for example, column 4, lines 25-55.

Regarding claim 27, Stentz teaches Raman amplification method wherein: said controlling step includes flattening a wavelength dependency of the noise figure. See, for example, column 4, lines 46-throught 54. Reducing the gain wavelength dependency by flattening the emission spectrum also reduces wavelength dependency of the noise.

Regarding claim 28, Stentz teaches Raman amplification method wherein: said second pump light is a wavelength division multiplex light. See, for example, lines 40-43.

Regarding claim 29, Stentz teaches a Raman amplification method wherein: said second pump light is not a wavelength division multiplex light. See, for example, column 3, lines 22-23.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 8-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stentz.

Regarding claim 8, Stentz teaches a Raman amplification method comprising steps of:

inputting from a signal output end of an optical fiber a first pump light so as to Raman-amplify an optical signal in said optical fiber;

inputting from a signal input end of the optical fiber a second pump light having a shorter wavelength than the first pump light so as to Raman-amplify the first pump light;

and inputting a third pump light having a shorter wavelength than said first pump light, wherein said second pump light having a different central wavelength than said third pump light.

Stentz teaches counter-propagating, with respect to each other, a first and second order Raman pump lights. Stentz also teach additional order pumps lights depicted as collectively propagating counter to a signal light. It would have been obvious to modify the Stentz reference by adding a third order pump to the apparatus of Stentz (Figure 7) input from the signal output end in order to further distribute, along the length of the transmission line, the signal gain.

Regarding claim 9, Stentz teaches a Raman amplification method wherein: the central wavelength of said second pump light being shorter in wavelength than that of the first pump light by an amount of a Raman shift. See, for example, column 3, lines 55-58.

Regarding claim 10, Stentz teaches a Raman amplification method wherein; said central wavelength of said second pump light not overlapping said optical signal. It is asserted that the overlap in second pump light range taught by Stentz and in the instant invention also overlaps the band where the second pump light does not amplify the optical signal.

Regarding claim 11, Stentz teaches Raman amplification method wherein: the central wavelength of said second pump light being shorter in wavelength than that of the first pump light by about an amount of a Raman shift. See, for example, column 3, lines 55-58.

Regarding claim 12, Stentz teaches Raman amplification method wherein: said second pump light is a wavelength division multiplex light. See column 3, lines 40-43.

Regarding claim 13, Stentz teaches Raman amplification method further comprising a step of: producing said first pump light from a semiconductor laser light source. See column 3, lines 40-43.

Regarding claim 14, Stentz teaches Raman amplification method further comprising a step of: introducing a fourth pump light so as to Raman-amplify said second pump light. See, for example, column 5, line 44-46. Note that the reference refers to the central wavelength of the third order pump. This indicates that there are plural pump sources pumping the second pump source.

Regarding claim 15, Stentz teaches Raman amplification method further comprising a step of: inputting from said signal input end of said optical fiber a fifth

pump light configured to Raman-amplify said optical signal. See, for example, column 5, line 44-46. Note that the reference refers to the central wavelength of the third order pump. This indicates that there are at least a center pump and one pump on either side of the center pumping the second pump source (the fourth and fifth pump lights).

Regarding claim 16, Stentz teaches Raman amplification method further comprising a step of: producing said first pump light from a semiconductor laser light source. See column 3, lines 40-43.

Regarding claim 17, Stentz teaches Raman amplification method wherein: said third pump light amplifies said second pump light. See, for example, column 5, line 44-46.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Agrawal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen C. Cunningham whose telephone number is 703-605-4275. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Tarcza can be reached on 703-306-4171. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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